

# Residential Energy Codes

27



A DDES Customer Information Bulletin



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<http://www.metrokc.gov/ddes/>

## Frequently Asked Questions

King County DDES has created customer information bulletins to inform the general public about the effect of codes and regulations on their projects. These bulletins are not intended to be complete statements of all laws and rules and should not be used as substitutes for them. If conflicts and questions arise, current codes and regulations are final authority. Because the codes and regulations may be revised or amended at any time, consult King County staff to be sure you understand all requirements before beginning work. It is the applicant's responsibility to ensure that the project meets all requirements of applicable codes and regulations.

### **The information in this bulletin applies only to single-family and multi-family dwelling units.**

In June, 1998, King County began enforcing the 1997 Washington State Energy Code and the Ventilation and Indoor Air Quality Code. Residential construction must meet the requirements of these codes. This bulletin explains how the 1997 codes pertain to the construction of different components of single-family and multifamily dwelling units.

### **Windows**

The 1997 Energy Code specifies that all glazing be tested and certified by the National Fenestration Rating Council (NFRC). Exceptions to this requirement are for untested glazing and glazing manufactured by small businesses. To determine the U-values for these products, use Table 10-6A for untested glazing, and Table 10-6B for the small manufacturers. These are specific values and cannot be calculated. Consequently, your choice of manufacturer and the type of window will have to be specified at the time of permit application.

Energy Code compliance hinges around installation of the correct windows. To avoid the need for costly window removal or replacement, you must specify your windows at the time of permit application. A window schedule form, available from the Department of Development and Environmental Services (DDES), must be submitted for all residential buildings, additions, and remodels. Remember that each window type will usually have a different U-value. Please complete all of the information requested in the glazing schedule.

### **How are prescriptive path tables used?**

The Washington State Energy Code contains multiple paths, or options, for compliance under Chapter 6. These paths all achieve similar heat loss with varying amounts of glass, on the basis of glass area to floor area. The paths are referred to by option number through the use of a Roman numeral in the left column. Looking down

## Frequently Asked Questions

the list, find the appropriate glass percentage for your project and determine your option number. Once you have chosen your option number, read across the page for the various R-values and U-values. The Energy Code permits the inclusion of an area of noncomplying glass as long as the rest of the glass is sufficiently better than code minimum to compensate for the loss of efficiency. King County has a Glazing U-Value Average Calculation Form that may be used for this calculation.

The only trade-offs permitted prescriptively are the U-value averaging for glass. Forms and checklists designed to make your application package as complete and correct as possible are available at King County DDES. These forms are similar to those used for documentation for the Northwest Energy Code. We hope that the process of reviewing and filling out the Application Assistance Form will help you understand and comply with these requirements.

## Residences heated with gas, oil, coal, propane, or wood

Following is a summary of the “base case” values for residences heated with other than electricity:

Please note: Heat-pump homes may comply with this path.

Above-grade Walls	2x6 w/R-19 insulation or 2x4 w/R-13 insulation + R-3.2 sheathing or 2x4 w/R-11 insulation + R-5 sheathing
Below-grade walls	R-19 (interior installation) or R-10 (exterior installation)
Ceilings/Roofs	R-30
Floors	R-19
Glazing w/74% AFUE furnace	21 % of floor area, U-Value 0.60
Glazing w/78% AFUE furnace	21 % of floor area, U-Value 0.65
Glazing w/88% AFUE furnace	21 % of floor area, U-Value 0.75
Glazing w/78% AFUE furnace	25 % of floor area, U-Value 0.45
Glazing w/78% AFUE furnace	30 % of floor area, U-Value 0.40
Glazing w/78% AFUE furnace	Unlimited, U-Value 0.25
Slab on grade	R-10, 24 in. total w/thermal break
Solid doors	U-Value 0.40

## Frequently Asked Questions

### Residences heated with electricity

Following is a summary of the “base case” values used for residences heated with electricity:

Above-grade Walls	See Table 6-1 Washington State Energy Code
Below-grade Walls	R-19 (interior installation) or R-10 (exterior installation)
Ceilings/Roofs	R-38 R-30 if vaulted single joist or rafter
Floors	R-30
Glazing	15 % of floor area, U-Value 0.40 18 % of floor area, U-Value 0.39 21 % of floor area, U-Value 0.36 25 % of floor area, U-Value 0.32 30 % of floor area, U-Value 0.29
Slab on grade	R-10, 24 in. total w/thermal break
Solid doors	R-5 U-Value 0.20

### Heating equipment

Table 6-2 specifies the minimum heating equipment efficiency required for homes heated with natural gas, liquefied petroleum gas, oil, coal, wood, and steam. Chapter 9 specifies the maximum heating equipment size limits allowed unless alternate heat-loss calculations are performed and submitted. (To get the number of watts from BTUs, divide by 3.413.)

### Component performance requirements (Chapter 5 trade-offs)

In the Energy Code, the most significant difference between the prescriptive and the component performance approaches is the allowed amount of glazing. Prescriptively, the maximum amount of glazing that can be installed is an area equaling 21% of the heated floor area for nonelectric heat. When determining the energy budget for component performance trade-offs, use a figure of 15% of the floor area. All other insulation values remain the same.

### What specific construction techniques are required for compliance?

Construction techniques that are required in order to comply with the Washington State Energy Code are summarized below:

### Sealing

All penetrations into and through the insulated envelope must be caulked and sealed. This includes sealing all wire penetrations through plates, openings in electrical boxes located in exterior walls, the joint between the subfloor and the sill plate (and the rim joist in two-story construction), and all other such openings in the exterior envelope created by ductwork, vents, plumbing, etc.

## Frequently Asked Questions

More than one type of product may have to be used in some areas in order to comply with all codes. When sealing wires that penetrate wall plates, please note that the UBC requires that a fire-stop material, such as rock wool, be stuffed in the opening around the wire. However, fibrous insulation does not meet the air sealing requirements of the Energy Code. In this case, it would be necessary to seal additionally with a caulk or foam type product. Products are available that will do both jobs in one. They are specially designed, tested, and approved for that use. Be sure to check the testing and listing on all such products.

### **Face-Stapled Insulation**

Batt insulation installed in walls and roofs now has to be stapled to the face of the stud, joist, or rafter rather than inset-stapled as has been permitted in the past. Drywall installers will probably recommend installing the drywall with screws to avoid potential nail-popping and will not like to see bunching or folds in the backing/vapor retarder.

### **Slab Insulation**

“Slab on grade” is defined as any slab installation where the top of the slab is within 24 inches of grade. Previously, there were no perimeter insulation requirements for slabs more than 12 inches below grade.

### **Unfinished Spaces**

There are no exceptions that allow unfinished spaces in a heated area to be left uninsulated until the area is finished. All portions of the heated structure must be insulated, whether or not the area is finished. This may require the use of an FS-25 (Flamespread 25) backed insulation if any heated spaces are intended to be left unfinished.

## **How is indoor air quality ensured?**

As we insulate our homes and make them more airtight, we not only save on our energy bills, but we also make our houses less subject to drafts, quieter, and generally more comfortable. However, this energy-saving technology carries along with it the responsibility to ensure healthful indoor air quality. The Ventilation and Indoor Air Quality Code Program includes many provisions in response to this concern, summarized below:

### **Mechanical ventilation**

Section 303 of the Ventilation Code outlines ventilation system requirements. The section applies to intermittently operated residential ventilation systems in dwellings with four or fewer bedrooms. Spot ventilation systems and intermittent whole house ventilation systems are included. Designs complying with the following equipment and sizing requirements are deemed to meet the code.

### **Spot ventilation systems**

Openable windows and doors will not meet the code.

Bathroom exhaust fans must be rated to provide at least 50 CFM at 0.25-inch static pressure as determined by HVI 916 (July 1989) or AMCA 210.

Kitchen exhaust fans must be rated to provide at least 100 CFM at 0.10-inch static pressure.

### **Intermittently operated whole-house systems**

Design requirements for whole house exhaust equipment are listed in Tables 3-2, 3-3, and 3-5 of the Ventilation Code. Ventilation systems meeting those requirements must have the following equipment:

## Frequently Asked Questions

### Exhaust fans

- ◆ All fans must provide the flows listed in Table 3-2 under .25-inch static pressure as tested in accordance with HVI 916 (July 1989) or AMCA 210.
- ◆ All surface mount fans must have an HVI sone rating no greater than 1.5.
- ◆ Remotely mounted fans must be acoustically isolated from the structure.
- ◆ Fans, as well as all other components, must be capable of continuous operation.

### Exhaust ductwork

- ◆ Ducts must be at least 4 inches.
- ◆ Duct sizes are based on flow and duct length, as given in Table 3.3.
- ◆ The number of elbows (or bends) is limited, as given in Table 3.3.
- ◆ Exhaust ducts in unconditioned spaces must be insulated to R-4.
- ◆ All ducts must terminate in a “hard connection” outside the building.
- ◆ Exhaust duct terminations must have a net free area that is at least as large as the area of the duct to which it connects.
- ◆ Duct terminations for intermittently operated exhaust ductwork must include a backdraft damper.

### Outdoor Air Inlets

Outdoor air shall be distributed to each bedroom, living room, dining room, and kitchen by individual room inlets or ducts. Adjoining rooms may be served by a single air inlet if they meet the following requirements:

- ◆ Half of the common wall is open, and the common open wall area is greater of 25 square feet or 1/10th of the interior room's floor area.
- ◆ Air inlets must be located away from exhaust registers and contaminants.
- ◆ Air inlets must be protected from insects and leaves.
- ◆ Individual room air inlets must have controllable and secure openings.
- ◆ Individual room air inlets must be located to avoid drafts.
- ◆ Doors must have 0.5” undercuts above the finished floor or grilles when they separate air inlets from exhaust points.
- ◆ Supply ducts in conditioned spaces must be insulated to at least R-4.

### Controls

Controls must allow continuous operation, as well as autonomic operation. This can be accomplished through use of a 24-hour clock timer.

Crank timers, while acceptable for spot ventilation control, are not acceptable in whole house systems.

Controls must not energize “other energy-consuming appliances.”

### Formaldehyde

Formaldehyde-emitting products may not be used for structural panels in residential construction if the emission levels are above certain levels specified in the Ventilation and Indoor Air Quality Code. The easiest way to comply with this provision is to be sure to use only those products which are stamped “exterior” or “exposure 1.”

## Frequently Asked Questions

### Additional information

The Washington State Energy Code may be purchased, for a nominal fee, from either the State of Washington, Building Code Council (360-753-1184) or the Washington Association of Building Officials (360-586-6725).

The Washington State Building Code Council has prepared a number of free brochures detailing requirements for the Energy Code and the associated Ventilation and Indoor Air Quality Code.

### Other bulletins and telephone numbers that may be helpful

Bulletin 1	Building and Development Permit Telephone Numbers
Bulletin 7	Obtaining a Mobile Home Permit
Bulletin 9	Obtaining a Residential Building Permit
Bulletin 12	Residential Building Permit Process
Bulletin 21	Sensitive Areas Review

206-296-6600 DDES Information



King County complies with the Americans with Disabilities Act (ADA). If you require an accommodation to attend a meeting (two weeks notice) or require this information in Braille, audiocassette, or large print, please call 206-296-6693 or TDD 206-296-7217.